

**UNITED STATES AIR FORCE
ARMSTRONG LABORATORY**

**A Study of the Use of Luminex Gloves
for Cleaning of Aircrew Helmet Visors**

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TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	iv
INTRODUCTION	1
LUMINEX GLOVES AND MATERIAL	1
SUMMARY OF RESULTS	2
CONCLUSIONS AND RECOMMENDATIONS	3
ACQUISITION AND SUPPLIER INFORMATION	3
REFERENCES	4
APPENDIX A.....	5
APPENDIX B	9

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182nd Tactical Fighter Squadron, 149th ANG , Kelly AFB, TX

147th Fighter Group, Ellington ANG, Houston, TX

559th Flight Training Squadron, Randolph AFB, TX

422 TES, Nellis AFB, NV

Det 3, 57WG, Cannon AFB, NM

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INTRODUCTION

A survey study of the use of gloves made from Luminex™ material to clean aircrew helmet visors was conducted by TASC for the Armstrong Laboratory (AL/OEO) as part of the Advanced Aircrew Vision Protection (AAVP) program to transition out-of-band laser eye protection (LEP) to the Human Systems Center. The findings of this study are summarized here. In general, the life support technicians who used the Luminex™ gloves found them to be very useful and effective in performing the cleaning of visors.

The primary reason that Air Force pilot helmet visors are removed from service is that they become scratched during operational use.¹ The cleaning and care of the visors is critical to maximize the useful life and to provide clear vision for the pilot during flight. Pilot visors are typically cleaned after each flight by life support technicians in the operational squadrons. The exact methods used for cleaning the visors vary slightly, but the basic method is to spray the visor with a cleaning fluid (non-ammonia-based glass cleaner, mildly soapy water or plain water) and then wipe it clean with a paper wipe.² There is no problem with cleaning visors in this manner. It does, however, require several expendable items and the time of the technicians to perform several steps. Because laser protective visors are expected to cost more than the current clear and sun visors, extending the useful life of the visors is important. Improved methods of maintaining laser protective visors as well as other visors were sought.

Gloves made from Luminex™ material were purchased and supplied to five different life support units for their use in the routine cleaning and maintenance of pilot helmet visors. Several of these life support units were supporting the flight evaluation of FV-series LEP visors as well as their normal duties of maintaining the clear and sun visors. The individuals using the Luminex™ gloves were provided product information related to Luminex™ material and were requested to complete a questionnaire (Appendix A) after they had used the gloves for a period of time. Nine completed questionnaires were received, and the results are presented below. Personal and telephone interviews were conducted with several of the participating life support individuals to get more complete feedback. Additionally, the gloves were provided to optical technicians at the Armstrong Laboratory for their use in handling visors, other eyewear, and delicate optical components. After some of the responses to the questionnaires were received, it was noted that some life support technicians thought that the Luminex™ material might be more useful in the form of a cloth rather than gloves. Several cloths made of the Luminex™ material were acquired and provided to life support individuals for their use and comment.

LUMINEX GLOVES AND MATERIAL

Luminex™ material is manufactured by Toray in Japan. It is distributed by Toray Marketing & Sales (America), Inc., New York. The Luminex™ gloves used in this study

were purchased from Universal Photonics, Inc., 495 West John Street, Hicksville, NY 11801.

The properties of Luminex™ material and its potential uses are described in the advertising literature from Toray (Appendix B). Luminex™ is described as an ultra-fine cleaning cloth with 220,000 microfibers per square inch. The microfibers permit the cloth to lift dirt and oily films from the surface of glass or plastic lenses without the use of chemicals and without leaving any lint on the surface. The surface is cleaned by simply wiping it with the Luminex™ material. Since the material has no chemicals in it, it can be washed, dried, and reused.

The Luminex™ material can be obtained as gloves (two sizes) or as cloths (four sizes available). The distributor, Universal Photonics, Inc., did not know if Toray would be willing to sell the Luminex™ material in large quantities for use in fabricating visor bags or other forms. The gloves that were purchased for this study were size Large. The cloths that were purchased were 11 3/4 x 11 3/4 inch squares.

SUMMARY OF RESULTS

The life support and laboratory technicians who evaluated the Luminex gloves all found them useful in cleaning and handling visors and other optical components. Most of the life support technicians were very enthusiastic about the use of the Luminex™ gloves and/or cloths to perform the day-to-day cleaning of pilot helmet visors. No problems in cleaning the visors were caused by the use of Luminex™ material. When the Luminex™ gloves or cloths were available, they were used by the majority of the life support technicians instead of the previously used methods. All but one technician recommended that the Luminex™ gloves be made available for use in their unit. Several technicians found the gloves useful for cleaning other items such as night-vision goggles, helmet-mounted displays, pilot glasses, and display screens. More than half of the technicians washed the gloves during the period in which they used them. After washing, they found that the gloves performed as well or almost as well as they had when they were new. Some comments were made that, after extended use, the gloves began to yellow and looked dirty even after washing. The appearance, however, did not affect the cleaning performance. Most technicians thought that the gloves would last two to six months in daily use. The life support technicians who found that the gloves were inconvenient to use said that they did not want to take the time to find the gloves and put them on or that putting the gloves on was not convenient because of the other cleaning procedures that they had to perform, such as wiping the oxygen mask with alcohol. These technicians were, however, very pleased with the Luminex™ cloth. Comments that express the enthusiasm of life support technicians were: "These gloves are outstanding," "I use the gloves all the time instead of the old way; can you get me some more?", "It is hard to believe that the Luminex works so well - its almost like magic," "They cut post-flight cleaning time in half!"

CONCLUSIONS AND RECOMMENDATIONS

From the results of the limited study of the use of Luminex™ gloves and cloth by life support technicians for cleaning pilot helmet visors, it is concluded that Luminex™ material offers a significant improvement in the method of performing routine post-flight visor cleaning. The gloves are preferred by some individuals, and in cloth form by others. It is recommended that the Luminex™ gloves and Luminex™ cloth be assigned National Stock Numbers (NSNs) and that they be made available to life support units throughout the Department of Defense. Size Large gloves and 11 3/4 x 11 3/4 inch cloths are recommended. Technical Orders (T.O.s) covering the care and cleaning of pilot helmet visors should be amended to describe the proper use of Luminex™ material for cleaning visors and to permit Luminex™ to be used as an alternate method of cleaning. Further evaluation of Luminex™ as a potential material for making visor bags or visor covers should be considered. Making a visor bag or visor cover from Luminex™ may prove to be too expensive and/or unnecessary if the gloves and cloth are available. The existence of or availability of other microfiber material was not investigated. It is not known if there are other similar materials that perform as well as Luminex™ that may be available from sources other than those listed.

ACQUISITION AND SUPPLIER INFORMATION

The Luminex™ gloves and cloths used in this study were obtained from:

Universal Photonics, Inc.
495 West John Street
Hicksville, NY 11801
Telephone: (516) 935-4000

The product descriptions and prices are as follows:

JH2001-LL Luminex Gloves (Large)
Unit price (pr) - \$10.50
11 3/4 x 11 3/4 Luminex Cloth (Gray-Zebra Stripe)
Unit price (ea) - \$8.75

Luminex gloves are also available from:

Edmund Scientific Company
101 E. Gloucester Pike
Barrington, NJ 08007-1380
Telephone: (609) 573-6250
Stock number G39,951
\$15.50 ea or \$13.50 ea (lots of 10 or more)

REFERENCES

1. Maier, D.A. & LaPage, C.S. Failure mechanisms in aircrew helmet visors.
AL-OE/TR-1996-XXXX, Brooks AFB, Texas (In preparation).
2. Care and Cleaning of Visors (included with visor), Gentex Corporation, TP0002
Revision 1.

APPENDIX A

QUESTIONNAIRE RESPONSES

APPENDIX A

The following is a compilation of all of the responses from the nine questionnaires related to the use of Luminex™ gloves that were received from life support personnel. The number following the response is the number of individuals who gave that response.

1. Were the Luminex gloves the proper size for you?

Too Small - 1 Too Large - 1 Just Right - 7

2. Did you find the Luminex gloves useful in cleaning and maintaining helmet visors.

Yes - 9 No - 0 No Opinion - 0

3. How often did you use the Luminex gloves for cleaning visors?

Daily - 7 More than twice a week - 0 Less than twice a week - 2

4. Did you use the Luminex gloves instead of your usual method for cleaning visors?

More than 50% of the time - 7 25 to 50% of the time - 1
Less than 25% of the time - 1 Did not use them - 0

5. Did you use the Luminex gloves in addition to your usual method for cleaning visors?

More than 50% of the time - 5 25 to 50% of the time - 0
Less than 25% of the time - 2 Did not use them - 2

- 5a. Would you recommend having Luminex gloves available for use in your life support unit?

Recommend - 8 Don't Recommend - 1 No Opinion - 0

6. Did the Luminex gloves cause any problems with cleaning visors?

Yes - 1 No - 8

If Yes: What was the problem? Difficult and inconvenient to put on.

7. Did you use the Luminex gloves for other purposes than cleaning visors?

Yes - 3 No - 6

If Yes: What was the other use(s)?

Cleaning night-vision goggles, helmet-mounted displays, aircrew glasses, and CRT displays

8. Did you wash the Luminex gloves during the time you had them?

Yes - 5 No - 4

If Yes: Did the gloves perform as well as when they were new?

Yes - 4 No - 0 Almost - 1

9. About how many months do you think one pair of Luminex gloves would last before you needed a new pair?

Less than one month - 0

Two months - 4

More than three less than six months - 3

One month - 1

Three months - 0

Six months or more - 1

10. In your opinion, would a visor bag made from Luminex material be helpful in maintaining visors?

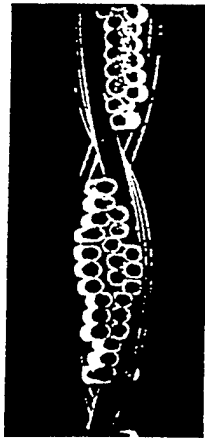
Yes - 6 No - 2 No Opinion - 1

APPENDIX B

PRODUCT DESCRIPTION

The Breakthrough Cleaning Fiber

The Luminex ultra-fine cleaning cloth is the result of superior fiber technology. With 220,000 microfibers per square inch—more than 10 times the average number in other cloths—Luminex actually performs like a sponge, lifting away grease and dirt. Luminex microfibers are so fine they cut through surface film and create thousands of tiny dirt-absorbent pockets. Regular cloths contain fibers too large to penetrate surface oils and have fewer pockets to hold dirt. Luminex also has no unstable fibers, so there's no lint left behind.



Regular cloth magnified 100 times.



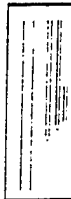
Luminex magnified 100 times.

Product Sizes and Colors

Four sizes are available in 8 colors and patterns: 7½", 9½", 11¾", 17¾".

POP Product Display

This convenient counter-top display



Luminex™

U L T R A F I N E C L E A N I N G C L O T H

A unique fabric that removes oily films as well as dirt—from Toray, world leaders in fiber technology.

LUMINEX Cleaning Cloths have an incredible 220,000 microfibers per square inch. The ultrafine weave gets *under* oily films and lifts them away with the dirt.

Nonabrasive LUMINEX is ideal for almost any smooth surface—glass and plastic lenses, multicoated camera lenses, fine crystal, jewelry, porcelain, and shiny metals. However, before wiping, be sure to remove any visible grit or dirt that could harm delicate surfaces.

LUMINEX is washable because it contains *no* chemicals. It can be pressed with a cool iron afterward. This unique fabric is a product of Toray research and advanced technology.

'TORAY'

Distributed by: Toray Marketing & Sales (America), Inc., New York, NY 10016

S-11